

Application Serial No. 10/643,376
Preliminary Amendment dated June 24, 2005
Reply to Office Action dated March 24, 2005

REMARKS/ARGUMENTS

This Preliminary Amendment is being submitted in response to the Final Official Action of the Examiner mailed March 24, 2005, and in response to the Advisory Action mailed June 24, 2005. *Please enter this Preliminary Amendment prior to the next action on the merits. Applicant respectfully requests non-entry of the Amendment-After-Final that was filed on May 23, 2005.* Reconsideration, examination, and allowance of all pending claims are respectfully requested.

First, Applicant hereby incorporates by reference the remarks made in the Amendment-After-Final that was filed on May 23, 2005. In the Advisory Action mailed June 24, 2005, the Examiner states that the Amendment-After-Final does NOT place the application in condition for allowance because "Worthington clearly teaches simultaneous heating and cooling".

Applicants must respectfully disagree. Worthington does not appear to contemplate the use a "heating device", as recited in, for example, claim 33. While the terms "latent heat", "sensible heat" and "sensible heat ratio" are used in Worthington, no "heater device" appears to actually be disclosed or used to achieve the desired sensible heat ratio. In discussing his invention, Worthington state:

The air conditioning system of the present invention is a servomechanism because it monitors the sensible heat ratio of the space being serviced and adjusts its operation accordingly.

A first sensor monitors the dry bulb temperature of the air in the space and a second sensor monitors the moisture content of that air. The dry bulb temperature and the moisture content of the air are electrically reported to a microprocessor that evaluates such data and issues commands to the system that adjusts the configuration of the system to efficiently achieve the desired sensible heat ratio of the space. In this manner, the output of the system is changed based upon the condition of

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the air being treated and energy requirements are thereby minimized. Importantly, the microprocessor balances the system so that a targeted removal of sensible heat is not overshot while the targeted removal of latent heat is being pursued, and vice versa.

In other words, the microprocessor governs the operation of the system so that it achieves its targeted level of sensible heat at the same time it achieves its targeted level of latent heat. Thus, the system lets sensible heat removal lag behind latent heat removal when the sensible heat ratio is low, and, conversely, the system lets sensible heat removal lead latent heat removal when the sensible heat ratio is high. The desired levels of temperature and humidity in the space are thus achieved substantially simultaneously. This eliminates the need for energy-squandering injections of heat or humidity into the space and minimizes electrical consumption.

The microprocessor controls two elements of the novel system: a variable speed supply air fan and a liquid subcooler having variable heat transfer capacity. When it is desired to remove more latent heat than sensible heat, a command indicating said desire is emitted from the microprocessor, and the supply air fan is slowed down so that air flows over the evaporator coils slowly. Thus, the air experiences prolonged contact with the evaporator coils and more moisture is condensed therefrom than would occur if the air flow were faster. Moreover, since less cool air is supplied to the space, the cooling effect that it has on the space being conditioned is reduced. Conversely, when the sensible heat ratio is high and the first goal of the system is to reduce the sensible heat the microprocessor, upon receiving this information from the space sensors, speeds up the supply air fan, thereby driving air over the coils at a faster rate. This reduces the dehumidification effect, but speeds the cooling of the space.

The novel system also includes still another means for responding to differing conditions in the space being conditioned. This additional means is provided in two different embodiments, but both embodiments include at least one row of subcooling coils disposed in the path of air leaving the evaporator coils. Accordingly, the refrigerant in the subcooling coils is cooled by an additional amount and the overall efficiency of the system is thereby increased since the efficiency of any heat engine increases as the temperature differences between its highest and coolest points increases. More particularly, for each one degree Fahrenheit decrease in the temperature of the refrigerant fluid, the total evaporator capacity is increased by one-half percent (0.5%). Moreover, the subcooling coils subtract back the sensible advantage gained, but do not take away the latent advantage.

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In a first embodiment, a plurality of subcooling coils are placed in the path of the air flowing over the evaporator coils, as aforesaid, and each coil is individually valved so that it can be placed into or taken out of the system, in effect, dependent upon information about the air conditioned space supplied to the microprocessor by the sensors. A bypass route is also provided so that all of the subcooling coils can be taken out of the system, in effect, when conditions call for that. Thus, all of the subcooling coils may be placed into service, all of them may be taken out, or any number of said subcooling coils may be employed between those two extremes as conditions warrant.

When the subcooling coils are bypassed, the circulating refrigerant flows to the expansion valve as in conventional systems without subcooling. The microprocessor will command the valves of all of the subcooling coils to close so that all of the refrigerant bypasses such coils when the humidity in the space is falling at a rate greater than the dry bulb temperature. Concurrently, the microprocessor will command the supply air fan to speed up, thereby moving the air over the evaporator coils more quickly to decrease the amount of dehumidification and to increase the volume of cool air flowing into the space. Thus, a decrease in the number of subcooling coils through which refrigerant accentuates the effect of an increase in supply air fan speed.

When the space monitors report to the microprocessor that the temperature in the space is dropping at a rate greater than the rate of dehumidification, the microprocessor will command the appropriate number of valves to open to obtain the desired amount of subcooling of refrigerant. For example, in an extreme situation, all of the subcooling coils would be opened and the supply air fan speed would be minimized to deal with latent heat removal that is substantially lagging behind sensible heat removal.

In an alternative configuration of the subcooling coils, the individual valves for each coil are obviated. Instead, rotatably mounted damper members are employed to control the rate of flow of air from the evaporator coils over the subcooling coils. Thus, when monitored conditions call for maximum subcooling, the dampers fully open and when no subcooling is called for, the dampers close and the air from the evaporator coils bypasses the subcooling coils and goes directly to the space being cooled. Any condition between those two extremes is handled by intermediate positions of the damper members, under the control of the microprocessor.

It is therefore clear that the primary object of this invention is to

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provide an air conditioning system that conserves electrical power by monitoring the sensible heat ratio of a space being air conditioned and controlling the internal operation of the air conditioning system accordingly.

(Emphasis Added) (Worthington, column 2, line 42 through column 4, line 29).

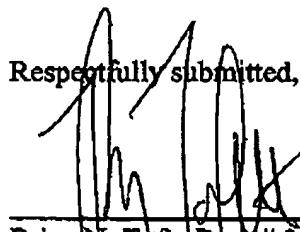
Applicant has also reviewed the other parts of Worthington, and has not found a single reference to a "heater device", as suggested by the Examiner in the comments attached to the Advisory Action. As such, Worthington cannot "clearly teach simultaneous heating and cooling", as the Examiner suggests.

Applicant has added new claims 64-70. Each of these claims is believed to be clearly patentable over the cited prior art.

Reexamination and reconsideration are respectfully requested. It is respectfully submitted that all pending claims are now in condition for allowance, and issuance of a Notice of Allowance in due course is respectfully requested. If a telephone conference might be of assistance, please contact the undersigned attorney at (612) 359-9348.

Respectfully submitted,

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